

Packaging for major Linux distributions

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Richard Stallman

“My work on free software is motivated by an idealistic goal: spreading freedom and cooperation. I want to encourage free software to spread, replacing proprietary software that forbids cooperation, and thus make our society better.”



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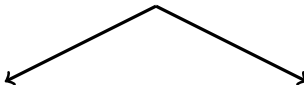
! Talks at the TU on the 11th of July !

Free Software Foundation

- Founded in 1985 by Richard Stallman
- Aim: promotion of free software
- **Free Software** should provide
 - ① the freedom to run the program for any purpose
 - ② the freedom to study how the program works, and change it to make it do what you wish
 - ③ the freedom to redistribute copies so you can help your neighbor
 - ④ the freedom to improve the program, and release your improvements
- Requires the availability of the source code
- **Free Software Definition ~ Open Source Definition**



Free Software Licenses



Copyleft licenses

- The license may not be restricted
- Software stays free
- Example: GPL



Permissive licenses

- The license may be restricted
- Software can be made proprietary
- Example: BSD, MIT



Distribution of Free Software

- The Linux kernel is released under the GNU GPL
- Linux distributions enrich the kernel with software packages
- **Distribution of software packages is at the heart of every Linux distribution**

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.tar.gz archive

- Makefile for compiling source code:

```
tar xzf foo_1.2.tar.gz
./configure
make
make install
```

- Build systems for creating the Makefile
 - GNU Autotools
 - CMake
 - ExtUtils::MakeMaker

.tar.gz archive - drawbacks

- How to deal with dependencies?
 - A depends on B
 - What if A is installed without B?
 - What if B is removed?
- How to deal with software updates?
- Is the publisher trustworthy?
- Is the package corrupted?

Package management systems

- System for managing all packages installed on a system
- Package contains metadata about publisher, version, dependencies, ...
- Database for keeping track of installed packages
- Features:
 - Managing dependencies
 - Installing, removing, updating packages
 - Downloading packages from a repository
 - Verifying the integrity of a package via checksum
 - Verifying the authenticity of the publisher

Linux package management systems

dpkg: Debian package management

- Debian, Ubuntu, Mint, Knoppix
- Package: .deb
- Manager: dpkg, apt, aptitude



RPM: RPM package management

- Red Hat, openSUSE, Fedora, Mandriva
- Package: .rpm
- Manager: rpm, yum, zypper



Pacman

- Arch Linux
- Package: .tar.xz
- Manager: pacman



Further package management systems

APK: Application Package

- Android
- Package: .msi

MacPorts

- MacOS

MSI: Microsoft Installer

- Microsoft

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RPM: RPM package Manager



- Red Hat (1997), openSUSE, Fedora, Mandriva
- Recommended by the Linux Standard Base (LSB)
- Packages:
 - Binary package: `foo_1.2-3.i386.rpm`
 - Source package: `foo_1.2-3.src.rpm`
- Database: `/etc/lib/rpm`

rpm and yum

rpm

Install

```
rpm -i pkg.rpm
```

Remove

```
rpm -e pkg.rpm
```

Update

```
rpm -U pkg.rpm
```

yum

Install

```
yum install pkg
```

Remove

```
yum remove pkg
```

Update

```
yum update pkg
```


.rpm file format

- .rpm is a binary file which includes
 - an identifier
 - a signature
 - metadata: name, version, architecture, dependencies
 - files in a gzip compressed cpio archive
- Extracting files from the cpio archive:

```
rpm2cpio pkg.rpm | cpio -idmv
```


dpkg: Debian package management system

- Debian, Ubuntu, Mint, Knoppix
- Tool: dpkg
- Front ends: apt, aptitude, synaptic
- Database: `/etc/var/dpkg/`
- Packages:
 - Binary package
 - `foo_1.2-3_i386.deb`
 - Source package
 - `foo_1.2-3.dsc`
 - `foo_1.2-3.orig.tar.gz`
 - `foo_1.2-3.debian.tar.gz`



dpkg commands

install package `dpkg -i pkg.deb`

remove package `dpkg -r pkg.deb`

status of package `dpkg -s pkg`

list installed packages `dpkg -l regex`

show configs `debconf-show pkg`

change configs `dpkg-reconfigure pkg`

APT: Advanced Packaging Tool

- Allows accessing different archives
- `/etc/apt/sources.list`
 - Package archives
 - `man sources.list`

```
deb[-src] URI DISTRIBUTION AREA+
```

```
deb http://ftp.debian.org/debian squeeze main contrib
```

```
deb-src http://ftp.debian.org/debian squeeze main contrib
```

```
deb file:/home/foo/debian stable main contrib non-free
```

- `/var/lib/apt/lists/`
 - Local database
- `/var/cache/apt/archives/`
 - Downloaded packages

APT: Advanced Packaging Tool

apt-get

```
update local database apt-get update
install package apt-get install pkg
remove package apt-get remove pkg
upgrade package apt-get upgrade pkg
```

apt-cache

```
search for package apt-cache search regex
show packages with prefix apt-cache pkgname prefix
show package information apt-cache show pkg
show dependencies apt-cache depends pkg
```

Binary package

- `foo_1.2-3_i386.deb`
- Contains compiled source
- Architecture dependent (e.g. FHS)
- Download:

```
apt-get install -d pkg
```

- ar archive

```
ar tf foo_1.2-3_i386.deb
ar xf foo_1.2-3_i386.deb
```

- Contains:
 - `debian-binary`
 - `control.tar.gz`
 - `data.tar.gz`

Binary package

- `debian-binary`
 - Version number (2.0)
- `control.tar.gz`
 - control file with metadata:
Package: vim
Version: 2:7.3.547-1
Architecture: i386
Maintainer: Debian Vim Maintainers
Installed-Size: 1797
- `data.tar.gz`
 - Compiled files
 - Can be extracted via `dpkg -x pkg.deb dir`
/usr/bin/vim
/usr/share/doc/vim

Source package

- Contains uncompiled source and packaging data
- `foo_1.2-3.dsc`
 - Metadata: name, version, dependencies
 - Signature
 - Checksum
- `foo_1.2-3.orig.tar.gz`
 - Original upstream source code
- `foo_1.2-3.debian.tar.gz`
 - Patches for the upstream source code
 - Rules for building a binary package
- Download:

```
apt-get source -d pkg
```

RPM vs. dpkg

RPM

- Proprietary formats
- Dependencies on file level
- Recommended by LSB

dpkg

- Default formats: ar, tar
- Dependencies on pkg level
- Not recommended by LSB

RPM vs. dpkg

RPM

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RPM and dpkg provide the same features

Alien

alien

Allows converting packages:

```
alien --to-rpm pkg.deb
```

```
alien --to-deb pkg.rpm
```

```
alien --to-tgz pkg.{deb,rpm}
```

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Debian social contract

Set of rules the debian community will abide by:

- ① Debian will remain 100% free
 - Debian and all components will stay free according to the [Debian Free Software Guidelines](#)
 - Non-free components will never be obligatory

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- ③ We will not hide problems
 - Bug reports will be open
- ④ Our priorities are our users and free software
- ⑤ Works that do not meet our free software standards
 - Will no be part of the Debian distribution
 - Will be provided in special archive areas (contrib, non-free)

Debian Free Software Guidelines

① Free Redistribution

- The software may be redistributed for free

② Source Code

- The source code must be open

③ Derived Works

- The source code may be modified and redistributed under the same license

④ Integrity of The Author's Source Code

- The source code may be restricted from being modified only if it may be patched by *patch files*

...

⑩ Example Licenses

- GPL, BSD

Debian Policy Manual










Describes policy requirements of a Debian distribution:

- The Debian archive
- The packaging system
 - Source packages
 - Binary packages
 - Relationships between packages
- The operating system
 - Filesystem Hierarchy Standard
 - Runlevels
 - User management

Debian archive

deb <http://ftp.debian.org/debian> squeeze main contrib




Index of /debian

<u>Name</u>	<u>Last modified</u>	<u>Size</u>	<u>Description</u>
 Parent Directory		-	
 dists/	12-May-2012 13:24	-	
 doc/	30-Jun-2012 15:52	-	
 indices/	14-Aug-2011 12:08	-	
 ls-lR.gz	30-Jun-2012 16:31	6.4M	
 ls-lR.patch.gz	30-Jun-2012 16:31	190K	
 pool/	19-Dec-2000 21:10	-	
 project/	18-Nov-2008 00:05	-	
 tools/	26-Jan-2011 00:05	-	

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Debian archive

deb <http://ftp.debian.org/debian> squeeze main contrib

Index of /debian/pool

<u>Name</u>	<u>Last modified</u>	<u>Size</u>	<u>Description</u>
 Parent Directory		-	
 contrib/	30-Mar-2012 04:52	-	
 main/	09-Apr-2012 12:02	-	
 non-free/	30-Mar-2012 04:50	-	

Debian archive

deb <http://ftp.debian.org/debian> squeeze main contrib

Index of /debian/pool

<u>Name</u>	<u>Last modified</u>	<u>Size</u>	<u>Description</u>
 Parent Directory		-	
 contrib/	30-Mar-2012 04:52	-	} Areas
 main/	09-Apr-2012 12:02	-	
 non-free/	30-Mar-2012 04:50	-	

Debian archive

deb <http://ftp.debian.org/debian> squeeze main contrib

Index of /debian/pool

<u>Name</u>	<u>Last modified</u>	<u>Size</u>	<u>Description</u>
 Parent Directory		-	
 contrib/	30-Mar-2012 04:52	-	
 main/	09-Apr-2012 12:02	-	
 non-free/	30-Mar-2012 04:50	-	

Debian archive

deb <http://ftp.debian.org/debian> squeeze main contrib

Index of /debian/pool/main/a/alien

<u>Name</u>	<u>Last modified</u>	<u>Size</u>	<u>Description</u>
<hr/>			
 Parent Directory		-	
 alien_8.81.dsc	18-May-2010 03:17	1.4K	
 alien_8.81.tar.gz	18-May-2010 03:17	62K	
[] alien_8.81_all.deb	18-May-2010 03:17	83K	
 alien_8.87.dsc	05-Apr-2012 20:02	1.4K	
 alien_8.87.tar.gz	05-Apr-2012 20:02	63K	
[] alien_8.87_all.deb	05-Apr-2012 20:02	83K	

Archive areas

Software which meets the *Debian policies* and is *not too buggy* may be added to one of the archive areas:

main

- Meets the DFSG
- Only depends on software within main

contrib

- Meets the DFSG
- Depends on software outside main

non-free

- Does not meet the DFSG

Sources



Free Software

<http://www.gnu.org/philosophy/free-sw.html>



Package management system

http://en.wikipedia.org/wiki/Package_management_system



Debian Policy Manual

<http://www.debian.org/doc/debian-policy/>



Debian Social Contract

http://www.debian.org/social_contract.en.html



Basics of the Debian package management system

[http://www.debian.org/doc/manuals/debian-faq/
ch-pkg_basics.en.html](http://www.debian.org/doc/manuals/debian-faq/ch-pkg_basics.en.html)



Alien

<http://wiki.debian.org/Alien>